REMARKS

Claims 1-6 are currently pending in the present application. Claims 1-4 stand rejected under 35 U.S.C. §103(a) for obviousness over United States Patent Application Publication No. 2002/0088748 to Doktycz in view of United States Patent Application Publication No. 2002/0088748 to Allcock et al. Claims 5-6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Doktycz in view of Allcock and in further view of U.S. Patent No. 6,017,742 to Takenishi et al. Applicants respectfully traverse these rejections for the following reasons.

The present invention is directed to a single step process of altering the properties of a capillary-pore membrane. In that single step, a compound is linked to endogenous carboxyl groups inherent generally only within a transmembrane passageway of the capillary-pore membrane. The cited references would not lead one of skill in the art to practice such a single step process.

Doktycz discloses a method of altering fiber surfaces within a channel of a nano-engineered membrane by covalently linking a coating to certain carboxylated defects on the fiber surfaces. Allcock indicates that capillary pores of etched membranes may have carboxyl functionality.

Contrary to the assertions in the Office Action, Doktycz does not disclose use of only endogenous carboxyl groups to alter the properties of a capillary-pore membrane. First of all, the membrane produced according to Doktycz is actually an engineered structure of carbon nanofibers that is constructed and grown between a substrate and a cover; it is not a capillary-pore membrane with endogenous carboxyl moieties. To the extent that the nanofibers are somehow comparable to the pores of a capillary-pore membrane and to the extent that they posses carboxylated defects, the only way that the properties of the nanofibers are altered is in a two-step process.

At para. [0036], Doktycz discloses a nano-engineered membrane for including a substrate and a cover, which may include a plurality of carbon fibers connected to and extending away from a surface of the substrate. The fibers may be chemically altered to affect the diffusion limits or effect selective permeability or facilitated transport by applying a coating that can be

applied to at least a portion of the fibers. Para. [0038] provides a detailed explanation of how the fibers are grown in a first step: vertically aligned carbon nanofibers (VACNFs) are grown between the substrate and a cover to define a channel. The fibers are then altered to control material transport in a second step as described in paras. [0044]-[0047] by applying a coating thereto. The coating may be linked to the fibers through carboxylated defects in the fibers, by first activating those defects with a coupling agent (such as a carbodiimide) and subsequent reaction with a moiety reactive therewith (such as a primary amine, R-NH_2.) See the description of "Covalent Coupling" described in para. [0069] and shown in Fig. 11 of producing an array of carbon fibers, which are then (1) activated with carboiimides and followed by (2) a reaction of the carboiimides with primary amines of polymers, proteins or other materials, to alter the properties of the fibers, i.e., to effect a desired control over the material transport through the array of fibers. As stated in para. [0069] (emphasis added):

> *These free carboxyl groups should be available for chemical derivatization by activation with carbodiimides and subsequent reaction with primary amines.* A variety of crosslinking agents, useful for coupling proteins, are available from Pierce Endogen which can be used to crosslink the VACNF to the polymers, proteins and other biomolecules. For example, the available carboxyl groups on the VACNFs may be derivatized with carbodiimides such as dicyclohexyl carbodiimide or 1-[3-(dimethylamino-)propyl]-3-ethyl carbodiimide hydrochloride, and reacted with N,N-diethylethylenediamine to create a surface.

This is distinct from the claimed invention, according to which a compound is linked directly to endogenous carboxyl groups to alter the properties of a capillary pore-membrane.

In fact, in all instances, Doktycz requires a preparatory step (activating carboxyl defects with a coupling agent) before a compound that alters the properties of the carbon fibers is attached thereto. The teachings in para. [0066] are particularly illustrative, which clearly explains that the fibers are first functionalized and subsequently modified to alter the fibers' transport and actuation properties (emphasis added):

> Chemical functionalization of the VACNF structures is necessary for constructing nanofiber sensors and for enabling selective transport and actuation properties when functioning as a membrane structure. Chemical functionalization can provide the essential interface between the solution phase entities desired to detect and control. Therefore, chemical derivatization schemes that alter the chemical and physical properties of the VACNFs should be used. These approaches exploit either the formation of carboxylic acid functionalities at the ends, as well as at sites of structural defects, *for subsequent derivatization or physiadsorption strategies involving more complex interactions*. Examples in this latter category include the adsorption of organics and complex polymers. In addition to these chemical-coupling schemes, the ability to electrically address the VACNFs enables other derivatization schemes to be considered.

Doktycz specifically describes the need to derivatize the carboxyl groups on the VACNFs in two steps in order to alter the properties of the VACNFs. Contrary to those teachings, Applicants have discovered that it is possible to alter the properties of capillary-pore membranes by linking a compound to the membrane only using endogenous carboxyl groups that are inherent in one or more transmembrane passageways in a capillary-pore membrane, as recited in claim 1.

While Allcock is cited for teaching that capillary-pore membranes produced via track-etching techniques results in carboxyl functionalities, that teaching does not provide any reason why or how the multi-step process of Doktycz should be modified. Doktycz teaches that carboxyl functionalities must be pre-treated with a coupling agent before a compound that alters the properties of the VACNFs can be attached thereto. Therefore, Allcock's teachings do not suggest modifying the specific teachings of Doktycz to perform a pre-treatment step followed by attachment of a property-altering compound. Moreover, Allcock also teaches a multi-step process of altering pore properties. According to Allcock, pores are filled with a liquid solution, and the solvent is evaporated to leave the solid behind, which does not alter the membrane itself, much less via covalent attachment to the pore wall. In any event, both Doktycz and Allcock

specifically teach away from the single step process as claimed (no pre-treatment of the transmembrane passageway surfaces) since both require pre-treatment. As such, the methods of claim 1 and dependent claims 2-4 are not taught by Doktycz in view of Allcock.

The teachings of the Takenishi patent provide no reason to modify those of the Doktycz and Allcock publications, particularly since Doktycz and Allcock provide no reason to practice the claimed one step process of altering the properties of a capillary-pore membrane. To the extent that Takenishi teaches a condensation reaction between carboxylic acid and amine or thiol groups to immobilize biologically active substances, it provides no reason to practice a method directly counter to the teachings of Doktycz and Allcock. Accordingly, claims 5 and 6 also define over the prior art of record.

Reconsideration of the rejections and allowance of claims 1-6 are respectfully requested.

Respectfully submitted,

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